AMENDMENT TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1 – 120 (cancelled)

121. (new) A tunable boundary detector for detecting features in a source image, the boundary detector comprising:

a tunable low-pass filter for filtering the source image to provide a filtered image;

an adjustable image sub-sampler for sub-sampling the filtered image to provide a sub-sampled image; and

a single-frequency edge detector for detecting edges in the sub-sampled image to provide edges, each edge having an edge position, a gradient magnitude, and a gradient direction.

122. (new) The tunable boundary detector of claim 121, wherein the position is expressed as real-valued coordinates.

123. (new) The tunable boundary detector of claim 121, wherein the image sub-sampler is controlled by a plurality of parameters.

124. (new) The tunable boundary detector of claim 121, wherein the sub-sampling amount of the image sub-sampler is controlled by at least one parameter.

125. (new) The tunable boundary detector of claim 121, wherein the constant-time low-pass filter is controlled by a plurality of parameters.

126. (new) The tunable boundary detector of claim 121, wherein the source image is one of a training image and a run-time image.

127. (new) The tunable boundary detector of claim 121, wherein the low-pass filter is a constant-time low-pass filter using substantially similar computational time over a range of adjustments of the filter.

128. (new) The tunable boundary detector of claim 121, wherein the low-pass filter is a second-order low-pass filter.

129. (new) The tunable boundary detector of claim 121, wherein the low-pass filter is substantially an approximation to a Gaussian low-pass filter.

130. (new) The tunable boundary detector of claim 121, wherein the low-pass filter is substantially an approximation to a parabolic low-pass filter.

131. (new) The tunable boundary detector of claim 121, wherein the a single-frequency edge detector comprises:

a gradient estimator adapted to provide an estimate of horizontal and vertical components of image gradient at each pixel position;

a Cartesian-to-polar converter adapted to convert each estimate of horizontal and vertical components of image gradient into an estimate of gradient magnitude and gradient direction;

a peak detector adapted to use each estimate of gradient magnitude and gradient direction to provide a column, a row, a gradient magnitude and a gradient direction; and

a sub-pixel interpolator adapted to use each column, row, gradient magnitude and gradient direction to provide a vertical component of edge position, a horizontal component of edge position, a gradient magnitude, and a gradient direction.

132. (new) The tunable boundary detector of claim 130, wherein the peak detector can be adjusted using a plurality of parameters.

133. (new) The tunable boundary detector of claim 130, wherein a noise threshold of the peak detector is adjusted using a parameter.

134. (new) The tunable boundary detector of claim 130, wherein the sub-pixel interpolator can be adjusted using a plurality of parameters.

135. (new) The tunable boundary detector of claim 130, wherein the Cartesian-to-polar converter uses a CORDIC method to compute gradient magnitude and direction.

136. (new) The tunable boundary detector of claim 130, wherein the Cartesian-to-polar converter computes both gradient magnitude and gradient direction to at least six bits.

137. (new) The tunable boundary detector of claim 130, wherein the gradient estimator computes the x and y components of gradient to 16 bits.

138. (new) The tunable boundary detector of claim 130, wherein the gradient estimator uses a Sobel kernel.

139. (new) The tunable boundary detector of claim 130, wherein the gradient estimator receives a 16-bit filtered image.

140. (new) The tunable boundary detector of claim 130, wherein the gradient estimator receives a 8-bit unfiltered image.

141. (new) The tunable boundary detector of claim 130, wherein the peak detector identifies a plurality of points where the gradient magnitude exceeds a noise threshold and is a local maximum along a one-dimensional profile that lies in approximately the gradient direction, and provides grid coordinates, gradient magnitude, and gradient direction for each such point.

142. (new) The tunable boundary detector of claim 141, wherein the sub-pixel interpolator interpolates position of maximum gradient magnitude along the one-dimensional profile to determine real-valued coordinates of each point so as to provide a plurality of points that lie along boundaries in the source image, including the grid coordinates, gradient direction, and gradient magnitude of each point.

143. (new) The tunable boundary detector of claim 121, wherein a parameter of the low-pass filter is set to pass fine detail so as to provide a high-resolution pattern.

144. (new) The tunable boundary detector of claim 121, wherein a parameter of the low-pass filter is set to attenuate fine detail so as to provide a low-resolution pattern.

145. (new) The tunable boundary detector of claim 121, wherein a parameter of the low-pass filter is set to disable the low-pass filter.

146. (new) The tunable boundary detector of claim 121, wherein the source image has eight bits of gray-scale per pixel, and the low-pass filter provides a filtered image having 16 bits of gray-scale per pixel.

147. (new) A tunable boundary detector for detecting features in a source image, the boundary detector comprising:

a tunable low-pass filter for filtering the source image to provide a filtered image;

a gradient estimator adapted to provide an estimate of horizontal and vertical components of image gradient at each pixel position;

a Cartesian-to-polar converter adapted to convert each estimate of horizontal and vertical components of image gradient into an estimate of gradient magnitude and gradient direction;

a peak detector adapted to use each estimate of gradient magnitude and gradient direction to provide a column, a row, a gradient magnitude and a gradient direction; and

a sub-pixel interpolator adapted to use each column, row, gradient magnitude and gradient direction to provide a vertical component of edge position, a horizontal component of edge position, a gradient magnitude, and a gradient direction.

148. (new) The tunable boundary detector of claim 147, further comprising:

an adjustable image sub-sampler, cooperative with the low-pass filter, for sub-sampling the filtered image to provide a sub-sampled image.

149. (new) A tunable boundary detection method for detecting features in a source image, the method comprising:

filtering the source image to provide a filtered image;

providing an estimate of horizontal and vertical components of image gradient at each pixel position;

converting each estimate of horizontal and vertical components of image gradient into an estimate of gradient magnitude and gradient direction;

using each estimate of gradient magnitude and gradient direction to provide a column, a row, a gradient magnitude and a gradient direction; and

using each column, row, gradient magnitude, and gradient direction to provide a vertical component of edge position, a horizontal component of edge position, a gradient magnitude, and a gradient direction.

150. (new) The method of claim 149, further comprising:

after filtering, sub-sampling the filtered image to provide a sub-sampled image.